THAT WHICH IS CLAIMED:

1. A system for optical detection of blowout precursors comprising:

a combustor;

an optical measuring device in communication with the combustor, wherein the optical measuring device generates an output indicative of the intensity of the light emissions in the combustor; and

a blowout precursor detection unit that receives the optical signals and performs at least one of a raw data analysis, spectral analysis, statistical analysis, and wavelet analysis to identify a blowout precursor.

2. The system as in claim 1, further comprising a combustion controller that controls operation of the combustor based at least in part on detection of a blowout precursor by the blowout precursor detection unit.

3. A method for detecting blowout precursors in combustors comprising:

receiving optical data measured by an optical measuring device associated with the combustor;

performing raw data analysis on the optical data normalized by the mean of the optical data;

performing spectral analysis on the optical data using Fourier transform analysis;

performing statistical analysis on the optical data using statistical moments;

performing wavelet analysis on the optical data using wavelet transform analysis; and

determining the existence of a blowout precursor based at least in part on one or more of the raw data analysis, spectral analysis, statistical analysis, and wavelet analysis.

4. A method for detecting blowout precursors in combustors comprising:

receiving optical data measured by an optical measuring device associated with a combustor;

performing raw data analysis on a normalized optical data, wherein the normalized optical data is the optical data normalized by the mean of the optical data; and

determining the existence of a blowout precursor based at least in part on the normalized optical data.

5. The method of claim 4, wherein determining the existence of a blowout precursor comprises determining the existence of a blowout precursor based on a predefined change in a magnitude of the normalized optical data.

6. The method of claim 4, wherein performing raw data analysis comprises:

dividing the normalized optical data into a plurality of time segments; and

defining a normalized optical data threshold.

7. The method of claim 6, wherein determining the existence of a blowout precursor comprises determining the existence of a blowout precursor based on a number of instances in a given time segment that the normalized optical data exceeds the normalized optical data threshold.

8. The method of claim 6, wherein determining the existence of a blowout precursor comprises determining the existence of a blowout precursor based on a total time in a given time segment that the normalized optical data exceeds the normalized optical data threshold.

9. A method for detecting blowout precursors in combustors comprising:

receiving optical data measured by an optical measuring device associated with a combustor;

performing spectral analysis on the optical data using Fourier transform analysis; and

determining the existence of a blowout precursor based on the spectral analysis.

10. The method of claim 9, wherein performing spectral analysis comprises:

determining a Fourier transform of at least part of the optical data; and

determining a power ratio of power in a frequency range normalized by total spectral power.

11. The method of claim 10, wherein determining the existence of a blowout precursor comprises determining the existence of a blowout precursor based on a predefined change in the power ratio.

12. The method of claim 9, wherein performing spectral analysis comprises:

determining a Fourier transform of at least part of the optical data; and

determining a power ratio of power at a specific frequency normalized by total spectral power.

13. The method of claim 12, wherein determining the existence of a blowout precursor comprises determining the existence of a blowout precursor based on a predefined change in the power ratio.

14. A method for determining blowout precursors in combustors, comprising:

receiving optical data measured by an optical measuring device associated with a combustor;

performing statistical analysis on the optical data using statistical moments; and

determining the existence of a blowout precursor based at least in part on the statistical analysis.

15. The method of claim 14, wherein performing statistical analysis comprises:

determining a statistical moment of at least part of the optical data.

16. The method of claim 15, wherein determining the existence of a blowout precursor comprises determining the existence of a blowout precursor based on a predefined change in a magnitude of the statistical moment.

17. The method of claim 14, wherein performing statistical analysis comprises:

determining a statistical moment of at least part of the optical data; and

determining the variance of the statistical moment.

18. The method of claim 17, wherein determining the existence of a blowout precursor comprises determining the existence of a blowout precursor based on a predefined change in the variance of the statistical moment.

19. The method of claim 14, wherein performing statistical analysis comprises:

determining a statistical moment of at least part of the optical data;

dividing the statistical moment optical data into a plurality of time segments; and

defining a statistical moment threshold.

20. The method of claim 19, wherein determining the existence of a blowout precursor comprises determining the existence of a blowout precursor based on a number of instances in a given time segment that the statistical moment exceeds the statistical moment threshold.

21. The method of claim 19, wherein determining the existence of a blowout precursor comprises determining the existence of a blowout precursor based on a total time in a given time segment that the statistical moment exceeds the statistical moment threshold.

22. The method of claim 14, further comprising filtering the optical data with a bandpass filter.

23. A method for determining blowout precursors in combustors, comprising:

receiving optical data measured by an optical measuring device associated with a combustor;

performing wavelet analysis on the optical data; and

determining the existence of a blowout precursor based at least in part on the results of the wavelet analysis.

24. The method of claim 23, wherein performing wavelet analysis comprises:

determining a wavelet transform of at least part of the optical data;

defining a root mean square of wavelet transform threshold; and

determining a ratio of the root mean square of the wavelet transform of the optical data to the root mean square of optical data.

25. The method of claim 24, wherein determining the existence of a blowout precursor comprises determining the existence of a blowout precursor based on a predefined change in the ratio.

26. The method of claim 23, wherein performing wavelet analysis comprises:

determining the wavelet transform of at least part of the optical data; and

defining a wavelet transform threshold.

27. The method of claim 26, wherein determining the existence of a blowout precursor comprises determining the existence of a blowout precursor based on a number of instances in a given time segment that the wavelet transform of the optical data exceeds the wavelet transform threshold.

28. The method of claim 26, wherein determining the existence of a blowout precursor comprises determining the existence of a blowout precursor based on a total time in a given time segment that the wavelet transform of the optical data exceeds the wavelet transform threshold.

29. The method of claim 23, wherein performing wavelet analysis comprises:

determining a wavelet transform of at least part of the optical data; and

determining statistical moment data from the wavelet transform of the optical data.

30. The method of claim 29, wherein determining the existence of a blowout precursor comprises determining the existence of a blowout precursor based on a predefined change in magnitude of the statistical moment data.

31. The method of claim 23, wherein performing wavelet analysis comprises:

determining a wavelet transform of at least part of the optical data;

dividing the statistical moment data into a plurality of time segments;

determining statistical moment data from the wavelet transform of the optical data for each time segment; and

determining the variance of the statistical moment data for each time segment.

32. The method of claim 31, wherein determining the existence of a blowout precursor comprises determining the existence of a blowout precursor based on a predefined change in the variance of the statistical moment data.

33. A method for detecting blowout precursors in combustors comprising:

receiving optical data measured by an optical measuring device associated with the combustor;

performing raw data analysis on the optical data normalized by the mean of the optical data;

performing spectral analysis on the optical data using Fourier transform analysis;

performing statistical analysis on the optical data using statistical moments;

performing wavelet analysis on the optical data using wavelet transform analysis;

receiving pressure data measured by an acoustic pressure device associated with the combustor;

performing spectral analysis on the pressure data using Fourier transform analysis;

performing statistical analysis on the pressure data using statistical moments;

performing wavelet analysis on the pressure data using wavelet transform analysis; and

determining the existence of a blowout precursor based at least in part on one or more of the raw data analysis of the optical data, spectral analysis of the optical data, statistical analysis of the optical data, wavelet analysis of the optical data, spectral analysis of the pressure data, statistical analysis of the pressure data, and wavelet analysis of the pressure data.

34. A method of controlling a combustor based on at least one combustor condition comprising the steps of:

acquiring at least one combustion condition from the combustor, wherein said combustor comprises a fuel-air intake;

determining the existence of a blowout precursor event based at least in part on the at least one combustor condition; and

increasing the fuel flow in the fuel-air intake of the combustor in response to the identification of the existence of a blowout precursor event.

35. A method of claim 34, wherein the at least one combustor condition comprises an acoustic pressure signal, an optical signal, or both.

36. The method of claim 34 further comprising the step of:

decreasing the fuel flow in the fuel-air intake of the combustor in response to not identifying the existence of a blowout precursor event.

37. A method of controlling a combustor based on at least one combustor condition comprising the steps of:

acquiring the at least one combustor condition from the combustor, wherein said combustor comprises a fuel-air intake and a pilot fuel intake, said fuel-air intake comprising fuel and air flow;

determining the existence of a blowout precursor event based at least in part on the at least one combustor condition;

increasing a fuel flow in the pilot fuel intake of the combustor in response to the identification of the existence of a blowout precursor event; and

decreasing the fuel flow in the fuel-air intake equal to the increase in the fuel flow in the pilot fuel intake.

38. The method of claim 37, wherein the at least one combustor condition comprises an acoustic pressure signal, an optical signal, or both.

39. The method of claim 37 further comprising the steps of:

decreasing the fuel flow in the pilot fuel intake of the combustor in response to not identifying the existence of a blowout precursor event; and

increasing the fuel flow in the fuel-air intake equal to the decrease in the fuel flow in the pilot fuel intake.

40. A method for detecting blowout precursors in combustors comprising the steps of:

receiving combustion data measured by a combustor measuring device associated with the combustor, wherein the combustion data is used to indicate flame blowout conditions;

performing analysis on the combustion data from the group of analysis techniques consisting of raw data analysis on the combustion data normalized by the mean of the combustion data, spectral analysis on the combustion data using Fourier transform analysis, statistical analysis on the combustion data using statistical moments, and wavelet analysis on the optical data using wavelet transform analysis; and

determining the existence of a blowout precursor based at least in part on one or more of the raw data analysis, spectral analysis, statistical analysis, and wavelet analysis.